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Swart, Jacobus; Zevenberg, Jorien

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Societal aspects of the fight against desertification

Report of the Workshop on "Participative approaches in the combat against desertification in China. Learning from international examples and insights," held between July 14 and 18, 2014, in Groningen, the Netherlands.

Jac. A. A. Swart* and Jorien Zevenberg*

Moving sand dunes in China (photo: J.A.A. Swart)

* Science & Society Group, Energy and Sustainability Research Institute Groningen, University of Groningen. E-mail: j.a.a.swart@rug.nl

Contents

"Don't let our future dry up"

Theme of 2013 UNCCD World Day to Combat Desertification (June 17, 2013)

The workshop "Participative approaches in the combat against desertification in China. Learning from international examples and insights," was organized as an activity within the University of Groningen's main theme "Sustainable Society" by the working group Science, Technology, Innovation Network Groningen for Sustainability (STINGS) and was funded by

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1. Introduction

It is widely recognized that the natural quality of drylands and rangelands is under threat, worldwide. Biodiversity loss and disturbance of natural processes are taking place on a global scale through desertification, which is related to agricultural reclamation, infrastructural developments, overexploitation of natural resources, climate change, mining, contamination by chemicals, etc. These developments not only reduce the quality of these natural and semi-natural areas but also have strong negative effects on people and communities. This is especially the case in developing countries where many people are highly dependent on the natural resources of the land. Drylands and rangelands cover about 41% of the global land surface and are home to around 38% of the people on earth. Worldwide, between 10 to 20% of the drylands and rangelands suffer from land degradation, which affects 250 million people.[1] This not only affects local people directly and locally. It also affects countries in a wider sense, and indirectly, through reduced agricultural productivity, siltation of rivers, dust storms, etc.[2]

China is one of the countries severely affected by the marching desertification of its rangelands. The rangelands, that is, drylands covered by natural grasses and scrubs, comprise more than 40% of the country's land surface and are home to 39 million people. Extensive grazing is the main activity on these lands, where drought and overexploitation result in diminished productivity and land degradation.[3] Until the second half of the twentieth century, regulation of these rangelands was mainly based on local customs and traditional social structures, which led to collectively regulated and often rather sustainable use of the rangelands. However, from 1949 until the economic reforms in 1978, these traditional management systems underwent major disturbance and were often not accurately replaced by new management regimes. This resulted in free-riding behavior with respect to for example livestock grazing, medical plant collecting, and consequently to desertification, which was already a threatening condition, as a result of natural climate variations.[4]

Since then, different management systems have been applied, often based on private use of rangelands around villages. However, these measures were often restricted by governmentally imposed conditions and grazing bans that affected the livelihood of people who were dependent on these natural resources, for example, through stock farming. These measures were unable to prevent further desertification through overgrazing, agricultural reclamation, and collecting wild medical plants. The important questions are therefore what kind of rangeland management is most appropriate, taking into account the position of local people, and how capacity building can be achieved that will contribute to more sustainable rangeland management in China.

2. Theoretical background of the workshop

Concern about the increasing global desertification and land degradation of drylands has been recognized by the United Nations and has resulted in the UN Convention to Combat Desertification (UNCCD) in 1994.[5] Physical and environmental management approaches are recognized as important measures in this fight: Protective conservation measures, water management, and ecological restoration projects come to mind. However, in recent years, growing attention has been paid to direct and indirect economic and social causes, their consequences, and subsequent remedies for desertification. In a white paper prepared for the 2nd Scientific Conference of the UNCCD in 2013 one of the conclusions states that: "Research into entitlement, environmental justice and vulnerability suggest that tackling desertification is not just adopting physical remedies, such as more 'sustainable land management,' even though the latter is important. Social remedies are required too, and this means that economic impacts and social impacts need to be tackled collectively in an integrated manner, rather than separately" (p. 43).[2]

Currently, land sustainability issues are increasingly considered from a human-environmental system (HES) or the related socio-ecological system (SES)[6] approaches that incorporate and integrate insights from the natural and social sciences and humanities, stressing the role of several, spatial, temporal, and organizational scales, and recognizing the importance of local knowledge and the involvement of local people.

In a publication in *Science* dated 2007, five principles of the so-called Dryland Development Paradigm (DDP) were put forward, reflecting the human-environmental systems (H-E systems) approach for sustainable dryland management:[1]

1. **Human-environmental system approach:** *"H-E systems are coupled, dynamic and co-adapting, so that their structure, function and interrelationships change over time."* The implication of this approach is that dryland livelihoods are very vulnerable to system-disturbing factors that are beyond their control and that management should take into consideration both human and ecological drivers. It also implies the important role of tailored approaches.

2. **Recognition of the importance of slow variables:** *"A limited suite of 'slow' variables are critical determinants of H-E system dynamics."* Slow variables are, for example, soil fertility and educational levels in a community. They have long-term turnover times and are easily

ignored in management focusing on short-term variables such as annual crop yield and disposable household cash income.

3. **Nonlinear behavior and threshold phenomenon:** *"Thresholds in key slow variables define different states of H-E systems, often with different controlling processes; thresholds may change over time."* This means that these human-environmental systems may show sudden irreversible changes in their state, triggered by development in one of the subsystems. An example of this is the provision of piped water or solar energy in remote villages, giving women opportunities (e.g., education), since they no longer have to spend time collecting water or fuel.

4. **The recognition of different hierarchically nested levels***: "Coupled H-E systems are hierarchical, nested, and networked across multiple scales."* This means that multiple stakeholders with different or competing objectives often operating on different scales are involved. For example, the management of rangelands in China involves stakeholders on different levels: the village, the county, the province, and the nation state.

5. **Local knowledge of the environment must play a pivotal role.** *"The maintenance of a body of up-to-date LEK (*Local Environmental Knowledge) *is key to functional co-adaptation of human-environmental systems."* This principle implies the development "hybrid" knowledge, that is, the integration of scientific and local or practical knowledge for local management and regional policies, mediated by institutional frameworks. The role of local knowledge is important, as it is based on long-term experiences (related to slow variables). However updating this knowledge is necessary, since "the traditional role of LEK is threatened by rapid changes in both biophysical (e.g., exotic-species introductions, shifts in climate) and socioeconomic (e.g., population growth, changing technologies, new economic demands) drivers." In addition, LEK development through experience is rather slow, "so identifying new alliances of local and science-based knowledge systems to speed up this acquisition is particularly important" (p. 850).[1]

3. Workshop presentations

Based on the aim of the workshop and the theoretical framework, we invited Chinese researchers involved in the fight against desertification in their country and international scholars in the field of the social issues of ecological sciences (see also the list of participants in

the appendix of the report) to present their experiences and insights. We organized the presentations into three main sections:

- Desertification in practice. Experiences from China and a few other countries concerning desertification and society.
- Participation and knowledge governance. Recent insights into the sharing, transfer, and coproduction of knowledge with and to stakeholders.
- Values and institutions. Insight into institutions as social constructions of values, rules, and structures, which contribute to the functioning of a society.

Desertification in practice

In three presentations, Guiying Gao, Lington Du, and Guotao Yang (Ningxia University, China) outlined China's fight against desertification, especially in the autonomous region of Ningxia that suffers intensely from desertification, which is related to overuse of water resources (from, e.g., the Yellow River), overpopulation surpassing the carrying capacity of the area, and climate change. Erosion, salinization, and moving dunes threaten arable land, human settlements, and cities. Especially over the past 20 years, which is considered to be a third phase in China's struggle against desertification that started in the mid-twentieth century, the measures taken in this region have been intensified and more directed towards human development. Besides technical measures, training and education, so-called "ecological migration" has been applied as a pivotal measure. Ecological migration implies a centrally organized relocation of peasants from the mountain slopes to new settlements in the valleys of central and south Ningxia. In the past four years, for example, nearly 350,000 people migrated to new villages, where infrastructure, homes, arable land, greenhouses, etc., were created and made available to the migrants.

In spite of international concern, this approach is considered in China as having been successful, since the speed of vegetation restoration is now greater than that of desertification in that area. These measures have led to the recovery of 42,000 hectares of forest and grassland in the Ningxia mountain area. According to surveys, the migration project has improved the living conditions of the peasants: household development capacity and public services (e.g., running water, electricity, etc.), along with access to education for these groups has been made much more accessible. However, a reduction in net income and social participation among the relocated people was also found.

In two presentations, Hoda Yacoub (Egyptian Environmental Affairs Agency, Egypt) and Hanaa Abdou (University of Groningen) sketched the relationship between desertification and society in Wadi Allaqi, Southern Egypt. They described how long-term periods of drought in this area have led to the disappearance of species on which these indigenous people are dependent

(for food, fodder, charcoal production, medicines, and grazing opportunities). Urged and sometimes even forced by governmental programs, these Bedouin people have been rehoused in new villages close to Lake Nasser. As a consequence local environmental knowledge about species has disappeared, especially among younger people. On the other hand, new knowledge has been generated. For example, Najas species growing in Lake Nasser are now recognized as an alternative for fodder. Current economic development, however, has led to eutrophication and algae growth that threaten the growing conditions for Najas species. This case demonstrates the strong mutual relationship between societal and ecological systems, and its impact on the economic livelihood of indigenous people.

Ab Groothans and Piet-Louis Grundling (University of Groningen) sketched how Palmiet (*Prionium serratum*) wetlands in southern South Africa turned into drylands, because flood waters had destroyed the peat soils of these wetlands. Palmiet is a semi-aquatic shrub that plays an important role in stabilizing riverbeds and riverbanks. The devastating floods were actually the result of the long-neglected maintenance of river dams, constructed for agricultural water reservoirs. As a result, they may suddenly break from time to time, damaging both natural and human infrastructures. From an HES or SES perspective we may consider the maintenance state of such dams as low variables that may trigger particular, unexpected dynamics at a certain level (threshold).

Participation and knowledge governance

Since local knowledge is important from the perspective of the human-environmental perspective to desertification, local participation is an essential element. Two elements are important in this respect: How should participation be organized and how can coproduction of local and expert knowledge be achieved through participation? Based on empirical research in many different countries and different contexts, Mark Reed and Julian Sidoli del Ceno (Birmingham City University, United Kingdom) described different forms of participation ranging from informal to formal methods, and from vertical or top-down to horizontal or bottom-up approaches. Informal bottom-up approaches, characterized by mediation in a polycentric or multi-stakeholder context, appear to be especially helpful in achieving a so-called win-win situation, that is, contributing to ecological as well as to social aims. Such mediation practices can only be successful if they are designed in relation to a specific context. So-called "one-size-fits-all approaches" easily fail.

Luuk Fleskens and Coen Ritsema (Wageningen University) presented the results of a study based on 17 study sites in different parts of the world. Their presentation demonstrated how sustainable land management (SLM) of arid areas could be attained through bottom-up

scenario assessment. That approach begins with the involvement of local stakeholders and the assessment of sociocultural, economic, environmental, and political contexts of an area, as basic input for the scenario studies. Accordingly, these scenarios are worked out by means of multidisciplinary research and are compared with the initial conditions through stakeholders and context assessments. Such concerted effort on the part of stakeholders and researchers on multiple scales achieves an approach that is effective in the fight against desertification, because it is based on local realities, is solution driven, and because it uses the perceptions of the stakeholders as a starting point.

Accordingly, Henk Mulder (University of Groningen) introduced the Science Shop methodology as a means of achieving strong collaboration between academic institutions and civil society organizations (CSOs). According to this approach, Science Shops mediate the response to research questions – often but not only when environmental issues are involved – on the part of CSOs. These research questions are answered by students, in projects under the supervision of researchers at a university or research institute. Since these projects are part of the curriculum (e.g., for a thesis), this method only entails low additional expenditures. It offers both easy access to up-to-date scientific knowledge for CSOs as well as helping students engage with societally relevant issues as part of their scientific training. This science-society interaction model has been introduced in a number of European as well as other countries in the form of a community-engaged kind of scientific knowledge creation. It was suggested that this model might also function in developing countries struggling with ecological degradation problems.

Jordi Cortina (University of Alicante, Spain), Mchich Derak (Direction Régional des Eaux et Forêts, Morocco), and Ramon Vallejo and Alberto Vilagrosa (both from the Fundación Centro de Estudios Ambientalis del Mediterráneo, Spain) presented a concrete example of knowledge transfer in the region of Alicante in Spain. Forest plantations are traditionally an important tool in fighting desertification. However, in recent decades there has been much more focus on ecosystem perspectives of restoration that involve the use of indigenous species and non-aggressive planting methods that try to restore the original ecology of an area. Stakeholders such as landscape managers, foresters, and the public will not immediately take up such paradigm shifts. Ecosystem-based restoration therefore requires a great deal of communication with the surrounding community. Different methods for the transfer of knowledge were presented, including scientific publications, demonstration projects, postgraduate courses, and citizen's workshops. The combination of such tools appears to be especially effective.

The presentation by Franke van der Molen (University of Groningen) focused on governance approaches to ecosystem management, and the role of knowledge in such approaches. Ecosystems are complex and various groups of stakeholders are involved in their utilization and protection. Therefore, ecosystem governance must often deal with uncertainty,

ignorance, conflicting values, and diverging approaches to and perspectives on knowledge. The latter are referred to as "knowledge systems": social systems that combine specific propositions and ways of creating and exchanging knowledge. In order to successfully mobilize knowledge for ecosystem management, there is a need for governance practices that actively engage with knowledge management, integrate the various stakeholder perspectives, are geared towards learning, and employ the co-creation of knowledge between stakeholders. This was illustrated by a successful case in the Dutch Wadden Sea, in which fishermen and conservationists were able, in spite of different knowledge systems and interests, to jointly develop an innovative form of sustainable mussel fishery in combination with ecosystem restoration.

Values and institutions

James Reynolds (Duke University, USA) made clear that desertification is not only an ecological and social phenomenon but also a moral challenge for mankind. He made use of two literary sources as a scenario: the famous novel *Crime and Punishment* by the Russian author Dostoevsky and the concept of the *Übermensch*, introduced by the philosopher Nietzsche. According to Reynolds, mankind is behaving like Rasko in Dostoevsky's novel, who considered himself to be an Übermensch permitted to murder Aloyna and Liza, and thinking that only his values and interests mattered. Similarly, mankind is destroying the earth and its indigenous peoples by overexploiting natural resources. The Desertification and Development Paradigm (DDP, see introduction to this report) is an elaboration of sustainable development, and was presented as an integrated framework of social and natural scientific disciplines that may offer means of escape from the catastrophic trajectories of current society by breaking with the dominant *Übermensch* attitude.

Reynolds's contribution demonstrates that values play an important role in the management of so-called common pool resources, where we can in general distinguish between utilitarian and ecocentric ethical perspectives. Sjaak Swart (University of Groningen) presented a description of Hardin's famous narrative "the tragedy of the commons"[7] that describes how rational behavior on the individual level can lead to the destruction of natural resources, which implies that, in the end, everyone will suffer. As a response, Elinor Ostrom and coworkers[8] have developed an empirically tested approach, which shows that this tragedy can be prevented by local community-based agreements and participation. Both approaches are basically game-theoretical models and have as a consequence a strong utilitarian flavor, that is, a focus on utility of natural resources. However, in reality we also find ecocentric motivations for abstaining from utilizing the "commons." In his presentation, Swart demonstrated that ecocentric, non-utilitarian

reasoning can also be considered as a stabilizing strategy from a game-theoretical modeling point of view.

The issue of common pool resources described by Swart is strongly related to land ownership. For example, Hardin argued that only private ownership or state-enforced regulation could prevent the occurrence of the "tragedy of the commons." Due to China's recent history, much confusion exists around ownership and access rights to the rangelands. Confusion as to access rights and ownership in China, which is also related to its dynamic political history, has led to overgrazing of the rangelands as consequence. To stop this devastating effect, grazing bans have been announced by the Chinese government.[4] However, this type of regulation has resulted in high enforcement costs, conflicts between herders and enforcers, widespread complaints among the population, and illegal (nocturnal) grazing practices. Accordingly, since the mid-1980s collective (thus non-state) property regimes were experimentally introduced in Ningxia. It appears that people have been abiding by these rules, although the right to harvest medical plants remains a source of conflict. This case demonstrates the importance of the mutual tuning of institutions with each other at different scales.

As stated in the introduction, the concept of HES or SES implies a recognition of the coadaptation of human and environmental subsystems, of nonlinear and threshold dynamics, of the critical role of slow variables, and of hierarchically nested structures. In her presentation, Lene Poulsen (United Nations Convention to Combat Desertification (UNCCD) and Karl International Development, Denmark) outlined the history of fifty years of international attention and struggle with desertification, especially via international UN-supported conferences. She acknowledged the HES and SES approaches and stressed, in addition, the role played by uncertainty, good governance, social capital, and the development of international institutions. However, she also made clear that the fight has not yet been won and that currently 40% of the earth's land surface still suffers from desertification, which threatens resources, human capacities, and community priorities.

Joost Herman (University of Groningen) also stressed the role of institutions. In this age of globalization especially, there is a need to adapt current political institutions to new circumstances and to guarantee a decent society on the local level. He argued that, in the twenty-first century, non-state institutions make up a much larger class than do the classic state-centered institutions. It was argued that interaction and spanning boundaries on the part of non-state institutions of stakeholders at the international, national, and local level are needed to fight desertification.

Using water management in the Netherlands as an example, Henny van der Windt, Sjaak Swart, and Menno Gerkema (all from University of Groningen) illustrated the need for institutional renewal and cooperation, focusing on the concept of "regimes." A regime is "a

shared and institutionalized set of cognitive, social, and technological rules that guide or govern change along certain trajectories." The example given is the way measures against flooding are organized in the Netherlands. Since the Middle Ages, this has been based on a regime-like concept incorporating technologies, communities, and shared responsibilities. As technologies change, societal orderings and values will also change, with consequences for the way stakeholders participate. For example, in the past, dike-building techniques, windmills, steam engines, and electricity have impacted the social ordering of flood protection. Nowadays, we see an increasing recognition of the value of nature, which is currently reflected in a revision of current water management tasks. Van der Windt argued that we should expect similar regime dynamics to be applied in the fight against desertification.

4. Discussion and reflections

Human-affected ecosystems should be considered as social-ecological systems because of the deep intertwining of social, ecological, and environmental processes. They exhibit complex behaviors because of the simultaneous occurrence of partly chaotic processes resulting in nonlinear, unexpected, threshold dynamics. So-called slow variables may especially trigger this behavior without being recognized as a main factor, because they are often masked by seemingly dominant fast variables. Slow variables may be physical (e.g., accumulation of salt in soils), biological (e.g., the appearance of pathogens), or social.

Grootjans and Grundling presented an example of a slow social variable by sketching how overdue maintenance of river dams in South Africa was overlooked because the right institutions were lacking. This resulted in sudden dam breaks causing devastating floods. Top-down, central institutions may be able to force measures to prevent such disasters; however, the literature demonstrates the costs entailed in this approach: unpopular regulatory agencies required, conflicts between stakeholders with different interests, illegal avoidance behavior, low level of efficiency, and lack of societal support. From that perspective, we may perhaps expect more from the use of participative approaches that imply the voluntary involvement of local stakeholders.[8] Several examples of such participative approaches were presented during the workshop. Cortina and coworkers discussed the participation of local stakeholders in projects that aimed to restore arid areas by means of so-called ecosystem approaches, which stress the value of native processes and species. Fleskens and Ritsema described how scientific approaches could deal with local interests by assessing them at an early stage of scenario development in arid areas, and Van der Windt and coworkers demonstrated the participative functioning of water management institutions in Dutch history.

In contrast, during the workshop two clear examples of top-down, state-driven combat measures against desertification were also described. Gao, Du, and Yang described how in the autonomous region of Ningxia large-scale migration projects have taken place that affect the livelihoods of hundred thousands of people in order to stop the ongoing devastating desertification, especially in the region's Loess Plateau. Although surveys indicate that there are social benefits from using that approach, it is apparent that it is not an example of participation. Similarly, Yacoub and Abdou sketched how in southern Egypt the lives of Bedouin people, who have led a desert-dwelling life style in balance with a harsh environment for hundreds or thousands of years, are currently urged through the establishment of villages by the government to give up that way of living. In both cases, we have populations who are relatively powerless and strongly affected by measures taken by central governments. The Chinese and Egyptian cases trigger an important question: *How can stakeholders participate in procedures on sustainable land use, in our case drylands, in countries with a state-driven tradition of environmental management?* We will approach this question by discussing participation and diversity, knowledge production, value achievement, and institutional dynamics based on the input provided by the presentations during the workshop.

Participation and diversity

One of the most often mentioned approaches to participation in the literature is based on the "ladder of participation" proposed by Arnstein.[9] This model proposes a continuum of increased stakeholder involvement: from a passive, predetermined role for people, to an active, voluntary engagement or citizen control; see figure 1. Although we do not have enough information to be able to place the Chinese and Egyptian cases on specific rungs of the ladder, it is quite clear that these cases are positioned more on the lower rungs: disregarding the level of nonparticipation and distinguishing between two classes of actors, namely

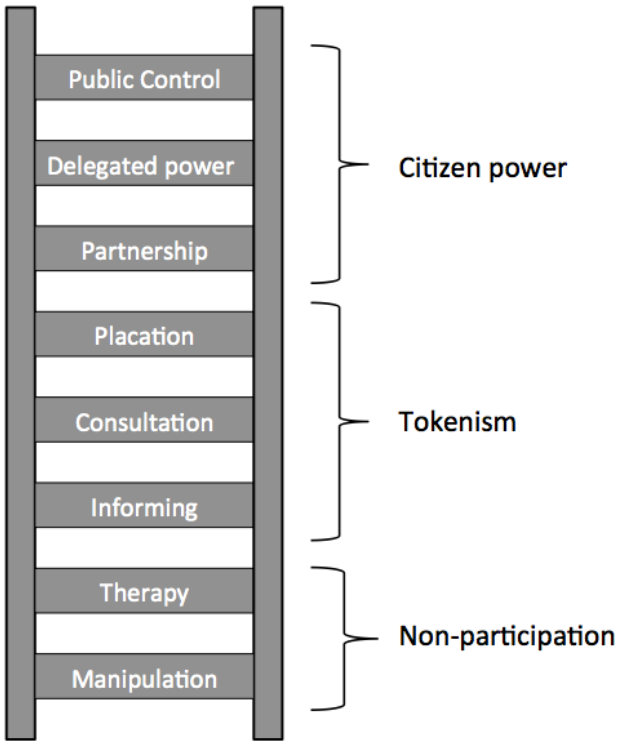

Fig. 1. Ladder of Participation. After Arnstein, 1969.

stakeholders that are affected without having much power and stakeholders that have influence. We may reinterpret Arnstein's approach in terms of two forms of participation: 1) informing and consulting stakeholders (tokenism), where the real decisions are made by a specific class of decision-makers; and 2) collaboration (citizens control), where decisions are made as collaborative actions of all stakeholders involved.

Arnstein's approach is essentially a ladder of power. During the workshop, the concept of participation was approached from a much more fine-tuned perspective by Reed and Sidoli del Ceno. They focused attention on the context of the participation, especially with regard to the diversity of the people involved and to the various institutional levels. Stakeholders, even at the grassroots level, often have different stakes, interests, knowledge, and power. Therefore, they may have quite different perceptions vis-à-vis the severity of the desertification and the impact on their lives (of environmental degradation and the measures taken). Recognizing this aspect implies horizontal interactions and participation among the various stakeholders. Conflict resolution, mediation practices, and trust-building initiatives are therefore important dimensions of participation.

Moreover, desertification as an HES/SES issue demonstrates different geographical, ecological, and institutional scale levels. This also contributes to the diversity of stakeholders, including local people, scientists, politicians, policy makers, and civil society representatives. Rationales, aims and interests, and evaluation criteria for success may thus differ at these different scale levels. Thus, in addition to horizontal participation, what is also required are vertical information flows in terms of interaction and participation among people acting at these different geographical, ecological, and institutional scale levels.

Recognizing the diversity of the stakeholders, along with the different levels of an HES/SES issue, therefore implies an important question: Who is responsible for defining who counts as a stakeholder, and, thus, who the insiders and outsiders are?[10] If we leave this question to active stakeholders only, we will run the risk that in a particular case only a particular group is involved, perhaps ignoring other stakeholder groups. This issue is also related to the power balance between the grassroots level and higher institutional circles. It implies that decent governance structures and open communication channels are needed to reduce the unjustified exclusion of stakeholders.

Knowledge production

The recognition of the intertwining of social and environmental systems as described in the DDP approach implies that purely scientific approaches are often not sufficient to describe the peculiarities of concrete systems, and to develop durable and sustainable solutions. On the other

hand, drylands may show rapid and unexpected dynamics (threshold effects) that can only be recognized and responded to by scientific insights and not by local knowledge traditions. So the main question is how we can realize an integration of local and scientific knowledge approaches, that is, so-called knowledge production modes, in order to develop the best of the two. Once again, this is a participatory issue that is now especially focused on the dimension of knowledge production. It implies the question: *How we can realize successful "hybrid" knowledge production practices*?

During the workshop, three presentations were especially relevant to this question. The contribution by Fleskens and Ritsema focused strongly on the upstream engagement of stakeholders in defining desertification problems and acceptable remedies. In this model, it is the scientists who are accordingly working out the scenarios, often in a very interdisciplinary mode. Thus collaborative participation happens especially with regard to problem definition, with non-scientific stakeholders functioning as a kind of a social benchmark.

The approach of Henk Mulder, who introduced the methodology of Science Shops, goes a step further, because societal clients are the initiators of the research in this model. Continuous feedback between scientists and clients should be the result. Finally, Franke van der Molen described the collaboration of fishermen and ecologists in an environmental conflict with different knowledge systems, and thus different truth claims. Despite the contrasting knowledge systems, these stakeholders were able to develop new knowledge and innovations collaboratively in order to tackle a long-existing environmental issue: the overexploitation of mussel ecosystems along the Dutch coast. Here we see forms of full collaboration in knowledge production by the different stakeholders, who have different knowledge systems, interests, and values.

Thus, different forms of participation with respect to knowledge production can be distinguished. This may vary from informing and consulting stakeholders with respect to problem definition and possible solutions, to full stakeholder collaboration in the knowledge production itself. It is important, however, to realize that knowledge production is quite different from decision-making in terms of political context, which is related to the distribution of power, as discussed in the section on participation above. Therefore, it may happen that a particular form of knowledge production is not practical for decision-making at a certain level or in a certain domain. For example, ecological knowledge about the dispersal of a particular bird species in a desert may be important to the Ministry of Environmental affairs in a country but is perhaps not of interest to farmers who are searching for grazing opportunities in that country. On the other hand, similar information about plant species may be very valuable for farmers. Interaction and participation with respect to knowledge production and decision-making by stakeholders (at any of Arnstein's levels) requires fine-tuning and collaboration. =

Value achievement

Exploitation of natural resources such as land, clean water, biodiversity, etc., is often justified by utilitarian considerations, because it may contribute to human welfare. According to this utilitarian line of reasoning, the consequences of our actions establish the moral justification. This utilitarian perspective also implies a critique on overexploitation, when it threatens human welfare, as the "tragedy of the commons" so clearly illustrates. However, utilitarianism is often criticized because it takes an anthropocentric position, that is, a position that takes the interest of humans as sentient beings as the starting point for value achievement. In contrast, many people aim to protect or restore ecosystems based on so-called ecocentric considerations, which implies that such ecosystems are thought to have an intrinsic value, that is, a value because of what they are and not because of their utility for humans. Often such considerations are considered to be personal or even solely emotional visions, and thus are seen as weak arguments in environmental-interest conflicts. Swart elaborated on the game of theoretical interpretation of ecocentric arguments, stressing that ecocentric value achievement can also be considered as a kind of utility and should therefore count much more strongly in terms of collective achievement of value.

The metaphor of the "tragedy of the commons" also demonstrates the tension between collective and individual interests. Since utilitarian ethics is often based on the view of "the greatest happiness for the greatest number of people," the collective interest should be uppermost, but this often requires implementation of strong institutional conditions. The distinction between individual and collective interests illustrates once again the existence of different scale levels in this discussion. It is often expected that governmental top-down institutions should be enough to ensure collective interests. However, the work of Elinor Ostrom and coworkers has shown that collaboration and participation at the community level may be able to safeguard collective interests, if the right social conditions are fulfilled.[8] Participatory efforts can help to establish such conditions.

Reynolds also took a collective perspective during the workshop by applying Dostoevsky's narrative of *Crime and Punishmen*t to the overexploitation of the earth. The collective interests of mankind are at stake, when we look at the threatening conditions of many arid areas. However, there is also an element of fairness involved here, because it is the indigenous people who suffer most from the negative developments that are mainly caused by the interests of parties who can easily escape these themselves.

Fairness is not a utilitarian motive. It belongs much more to so-called deontological ethics or right ethics that stress the role of certain principles such as fairness, respect for autonomy (of people, animals, and ecosystems), and the food sovereignty of people.

Participation with respect to decision-making and knowledge production may also be considered from that point of view, thus not only as an instrument to realize long-term sustainability goals but also as a moral principle in and of itself, which stresses the moral right of (poor) people to have a voice when their livelihood is at stake.

Institutional dynamics

Hodgson defines institutions as "systems of established and embedded social rules that structure social interactions."[11] Accordingly, he considers organizations as special institutions that also involve criteria and principles for membership, obligations, and responsibility. Institutions may thus refer to widely accepted and honored values, customs, and rules, but also refer to political, economic, and social bodies expressing these dominant customs, rules, and values. They may force people to comply with them insofar as they can be considered as members of these structures or bodies. Examples of this latter type of institution are international conventions and agreements on desertification that were discussed by Poulsen. And indeed these institutions are very important in the fight against desertification that does not stop at political or other societal boundaries. Herman stressed the role of such institutions and the need to develop new institutions, especially in the context of globalization. Desertification and the measures taken often cross the boundaries of ecological, geopolitical, institutional, and political units, which then require new boundary-spanning institutions.

An example of the dynamics of such institutions is that of water management bodies discussed by Van der Windt and coworkers. In this context, the concept of "regimes" is relevant: "a shared and institutionalized set of cognitive, social, and technological rules that guide or govern change along certain trajectories." Thus, not only does the regime concept refer to rules in line with the definition of institutions but it also stresses interdisciplinary aspects of institutions, the role of innovation, and transitions. Fighting desertification must indeed be considered as a societal sustainability transition, requiring much more than only knowledge production and participation. It also requires new forms of cooperation between different groups on regional, national, and international levels, as was also stressed by Herman during the workshop.

The regime concept also refers to innovation and technological change. Science and technology may be considered as important drivers of social change in contemporary society. Geo-information systems, improved crops, sustainable irrigation methods, ecosystem-based restoration, communication technology, etc. – these may all contribute to the dynamics of institutions and may also be used in the struggle against desertification. However, we should prevent such new technologies and their accompanying knowledge-producing institutions from

increasing the socioeconomic and technological divides between the haves and have-nots. Institutions such as, for example, Science Shops could be a relatively easy-to-achieve institution in poor countries in order to give the poor and civil society organizations better access to scientific knowledge, and they may at the same time contribute to societal skills and the consciousness building of students in terms of the role of science. This type of institutional renewal must therefore also be accompanied by rule and value development, which stress the needs and the positions of the poor. As was clearly outlined by Reynolds, the fight against desertification is in the end also a moral issue.

5. Conclusions and recommendations

The discussion demonstrates that the four issues – participation, knowledge, values, and institutions – are strongly related and should be integrated. Nevertheless for clarity's sake we will list a number conclusions based on the discussion above. Accordingly, we will formulate some recommendations especially for the Chinese case, based on our conclusions and on discussions during the workshop.

Participation and diversity

- Different levels of participation can be distinguished, ranging from being informed and consulted, to full stakeholder control.
- A high diversity of stakeholders often exists with respect to stakes, values, level of being affected, power, and problem and solution definitions.
- Different scale levels exist with respect to ecology, geography, and social institutions, which also contributes to the diversity of stakeholders.
- Vertical and horizontal forms of interaction often need to take place in HES or SES issues in order to make participation successful.
- Decisions on who should be considered a stakeholder or not, is not an objective given and requires decent consideration and decision-making.

Knowledge production

- Although related, participation in decision-making can be distinguished from participation in knowledge production.

- Different levels of participation in knowledge production can be distinguished, ranging from being informed and consulted with regard to problem definitions and possible solutions, to full collaboration in knowledge production itself.
- Different stakeholders may have quite different knowledge systems, that is, truth claims, values, and interests. The value and the applicability of new knowledge may differ for the different stakeholders.

Value achievement

- In addition to anthropocentric utilitarian ethics, non-anthropocentric ecocentric ethical considerations should also count in achieving value realization with respect to the fight against desertification.
- Collective interests in terms of the preservation of common pool resources need not be exclusively protected by governmental bodies. Under the right conditions, communities should be able to protect the collective interest as well as the natural resources which they are dependent on.
- Fairness, autonomy, and the food sovereignty of local people are principles from right-based ethics that should be taken into account in the fight against desertification.

Institutional dynamics

- Institutions are considered as being widely accepted; honored values, customs, and rules are often represented by social bodies.
- The fight against desertification requires the help of international institutions. In the context of current globalization, the need for boundary-spanning, new institutions will only grow.
- The concept of regimes stresses the fact that institutions can function as societal drivers of change but at the same time also need to reflect new social and technological developments.
- The establishment of those new knowledge-producing institutions must not increase the divide between the haves and have-nots. We should therefore search for collaborative forms of knowledge production.

Recommendations

We began the discussion with the assessment that the Chinese and Egyptian cases do not show a high level of participation in the fight against desertification. When we look at Arnstein's

definition of participation[9]: "the redistribution of power that enables the have-not citizens, presently excluded from the political and economic processes, to be deliberately included in the future" (p. 216), we may perhaps conclude that because of China's strong tradition of hierarchical, state-driven policy making, limited possibilities exist for participation. However, we have fine-tuned the concept of participation by recognizing the diversity of stakeholders, the role of scale levels, distinguishing between participation in decision-making and participation in knowledge production, and the role of values and institutions. We think that even in state-driven political traditions such as this, fine-tuning may provide multiple suggestions for developing and improving practices of participation.

Currently, attention is already being paid by Chinese scientists to involving local people in the fight against desertification.[12] During the workshop, different options were discussed with the Chinese participants. They appeared to be very interested in the concept of nonlinear dynamics of human-environmental and social-ecological systems. Concepts such as complexity, resilience, ethical values, and knowledge systems, for example, are relatively unknown in Chinese academic and university circles, and there is a great need and desire for increased knowledge about these issues, which may imply new participative initiatives in the Chinese context. Moreover, there is a need to train students in these topics. Compiling a list of accessible introductions to these topics was suggested as a first step.

Another issue was the Chinese interest in the establishment of the coproduction of knowledge by initiatives such as, for example, Science Shops and interdisciplinary science-education programs, including social and natural scientific disciplines. Finally, the concept of the intertwining of ecological and social processes as put forward by the DDP approach suggested several research directions, where collaboration between Western and Chinese scholars might be successful. Recognition of different scale levels, the diversity of stakeholders, the difference between decision-making and knowledge production, and the role of values and institutions may thus contribute to participation in the Chinese context and contribute to the successful fight against desertification.

In summary, the following concrete recommendations were suggested:

- A workshop on participating in the fight against desertification should be organized in the Chinese academic context, making use of the insights that were generated during this workshop.
- Exploration of collaborative research endeavors between Chinese and Western scientists making use of HES and SES approaches in order to develop new paradigms in the fight against desertification.

- Establishment of Science Shop-like institutions to involve local stakeholders and to teach Chinese students to tackle society-inspired research questions.
- Developing a list of accessible scientific texts on topics such as complexity, resilience, ethical values, and knowledge systems.
- Development of an undergraduate course on these topics.
- Establishment of train-the-trainer initiatives: courses, workshops, etc.

6. Acknowledgements

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8. Appendices

Participants and visitors of the workshop (p) and authors of the presentations (a)

Abdou, Hanaa	Science and Society Group (SSG) Energy and Sustainability Research Institute Groningen University of Groningen The Netherlands	p, a
Cortina, Jordi	Department of Ecology / Multidisciplinairy Institute for Environmental Studies (IMEM) University of Alicante Spain	p, a
Derak, Mchich	Direction Régionale des Eaux et Forêts et de la Lutte Contre la Désertification du Rif. Morocco	a
Du, Lingtong	Key Laboratory for Restoration and Reconstruction of Degraded Ecosystem in North-western China Ningxia University Yinchuan, China	p, a
Fleskens, Luuk	Soil Physics and Land Management Wageningen University The Netherlands	p, a
Gao, Guiying	School of economics and management Ningxia University Yinchuan China	p, a
Gerkema, Menno	Science & Society Group (SSG) Energy and Sustainability Research Institute Groningen University of Groningen The Netherlands	p, a
Grootjans, Ab	Centre for Energy and Environmental Sciences (IVEM) Energy and Sustainability Research Institute Groningen University of Groningen The Netherlands	p, a
Grundling, Piet-Louis	Centre for Energy and Environmental Sciences (IVEM) Energy and Sustainability Research Institute Groningen University of Groningen The Netherlands	a
Herman, Joost	Globalisation Studies Groningen (GSG) University of Groningen The Netherlands	p, a
Jeu, Jan de	Vice president Board of the University of Groningen University of Groningen Netherlands	p
Molen, Franke van der	Science & Society Group (SSG) Energy and Sustainability Research Institute Groningen University of Groningen Netherlands	p, a
Mulder, Henk	Science & Society Group (SSG) Energy and Sustainability Research Institute Groningen University of Groningen The Netherlands	p, a

Poulsen, Lene	Working Group II of the United Nations Convention to Combat Desertification (UNCCD) Second Scientific Conference / Independent consultant at Karl International Development Denmark	p, a
Reed, Mark	Centre for Environment & Society Research Birmingham School of the Built Environment Birmingham City University United Kingdom	p, a
Reynolds, James F.	Nicholas School of the Environment Duke University Durham State Administration Program of Foreign Experts Lanzhou University Lanzhou, China	p, a
Ritsema, Coen	Soil Physics and Land Management Wageningen University The Netherlands	a
Sidoli del Ceno, Julian	Centre for Environment & Society Research Birmingham School of the Built Environment Birmingham City University United Kingdom	p, a
Swart, Sjaak	Science & Society Group (SSG) Energy and Sustainability Research Institute Groningen University of Groningen The Netherlands	p, a
Vallejo, Ramon	Fundación Centro de Estudios Ambientales del Mediterráneo (CEAM) Spain	a
Vilagrosa, Alberto	Fundación Centro de Estudios Ambientales del Mediterráneo (CEAM Spain	a
Windt, Henny van der	Science & Society Group (SSG) Energy and Sustainability Research Institute Groningen University of Groningen The Netherlands	p, a
Yacoub, Hoda	Wadi Allaqi Biosphere Reserve Nature Conservation Sector Egyptian Environmental Affairs Agency (EEAA) Aswan Egypt	p, a
Yang, Guotao	Ningxia University Yinchuan China	p, a
Zevenberg, Jorien	Science & Society Group (SSG) Energy and Sustainability Research Institute Groningen University of Groningen The Netherlands	p

Program Workshop "Participative approaches in the combat against desertification"

Mon July 14	**Chair: Sjaak Swart**		
09:30 – 09:45	Welcome	Jan de Jeu	University of Groningen (NL)
09:45 – 10:45	Introduction to the workshop & introductory round	Sjaak Swart	University of Groningen (NL)
10:45 – 11:15	**Break**		
11:15 – 12:00	*Desertification as a global challenge. Key challenges for sustainable dryland management*	Lene Poulsen	United Nations Convention to Combat against Desertification (UNCCD) (DK)
12:00 – 13:00	General discussion		
13:00 – 14:00	**Lunch**		
14:0o – 14:45	*A theory of participation: why does stakeholder participation in environmental management lead to different outcomes?*	Mark Reed & Julian Sidoli del Ceno	Birmingham City University (UK)
14:45 – 15:30	*Typical experience of adaptation to climatic change in inland China*	Guiying Gao	Ningxia University (CN)
15:30 – 15:45	**Break**		
15:45 – 16:30	*Combating desertification in Ningxia, China and its management experience*	Lingtong Du	Ningxia University (CN)
16:30 – 17:15	*The evaluation of the effect of ecological migration on peasants' development capability*	Guotao Yang	Ningxia University (CN)
17:15 – 17:45	General discussion		
18:30 – 20:30	**Dinner**		
Tue July 15	**Chair: Menno Gerkema**		
09:30 – 10:15	*Crime and Punishment: Can integrated, trans-disciplinary studies provide Magical Roadmaps for sustainable development in drylands?*	James Reynolds	Duke University (US)
10:15 – 11:00	*Managing the commons. Values of nature.*	Sjaak Swart & Henny van der Windt	University of Groningen (NL)
11:00 – 11:15	**Break**		
11:15 – 12:00	*Knowledge systems for environmental governance: Lessons from coastal management in The Netherlands*	Franke van der Molen	University of Groningen (NL)
12:00 – 13:00	General discussion		
13:00 – 14:00	**Lunch**		
14:00 – 14:30	*Desertification in Allaqi and new resources of fodder*	Hoda Yacoub	Egyptian Environmental Affairs Agency (EG),
14:30 – 15:00	*Indigenous knowledge and desertification in Wadi Aallaqi, Egypt*	Hanaa Kandal	University of Groningen (NL)

15:00 – 15:15	**Break**		
15:15 – 16:00	*Reciprocal knowledge transfer for effective dryland restoration*	Jordi Cortina, Mchich Derak, Ramon Vallejo & Alberto Vilagrosa	University of Alicante (SP)
16:00 – 17:00	General discussion		
Wed July 16	**Chair: Henny van der Windt**		
09:30 – 10:15	*Erosion in South Africa and how to stop it*	Ab Grootjans	University of Groningen (NL)
10:15 – 11:00	*Role of institutions*	Joost Herman	University of Groningen (NL)
11:00 – 11:15	**Break**		
11:15 – 12:00	*Integrating participative approaches and model assessments of land degradation mitigation options: experiences from the DESIRE project*	Luuk Fleskens & Coen Ritsema	Wageningen University (NL)
1200 – 12:45	*Science shops*	Henk Mulder	University of Groningen (NL)
12:45 – 13:00	General discussion		
13:00 – 14:00	**Lunch**		
14:00 – 18:30	Museum, city walk, and drinks		
Thu July 17	**Chair: Sjaak Swart**		
09:30 – 10:15	*Innovation, societal levels and land use*	Henny van der Windt, Sjaak Swart & Menno Gerkema	University of Groningen (NL)
10:15 – 10:45	**Break**		
10:45 – 11:30	Conclusions, Discussion & New steps	Sjaak Swart & Menno Gerkema	University of Groningen (NL)
11:30 – 13:00	Schiermonnikoog preparation of the excursion	Ab Grootjans	University of Groningen (NL)
13:30 – 1300	**Lunch**		
14:00 – 16:30	Bus & Boat to Schiermonnikoog		
18:00 – 19:30	**Dinner**		
19:30 – 21:00	General discussion: Participation in China	Sjaak Swart & Menno Gerkema	University of Groningen (NL)
Fri July 18			
09:00 – 13:00	Excursion Schiermonnikoog: coastal management	Ab Grootjans	University of Groningen (NL)
13:30 – 15:30	Boat & Bus to Groningen (lunch @ boat)		
15:30	Back in Groningen, end of the program		